

## Description:

Belden's PVC Vari-Twist series was designed to reduce crosstalk in the balanced mode by twisting the pairs, but can be mass-terminated in the flat sections with standard IDC connectors.

## Physical Characteristics (Overall)

### Conductor

#### AWG:

| # Pairs | AWG | Stranding | Conductor Material |
|---------|-----|-----------|--------------------|
| 17      | 28  | 7x36      | TC - Tinned Copper |

Conductor Spacing Center to Center Flat Section: .050 +/- .005

Conductor Spacing Outside Center to Outside Center: 1.65 +/- .015

### Insulation

#### Insulation Material:

| Insulation Material      | Wall Thickness (in.) |
|--------------------------|----------------------|
| PVC - Polyvinyl Chloride | 0.010                |

Substrate Thickness and Material: .005 PVC

### Outer Shield

#### Outer Shield Material:

| Outer Shield Material |
|-----------------------|
| Unshielded            |

### Overall Cabling

Overall Nominal Thickness Flat Section: .042 +/- .003

Overall Nominal Thickness Twisted Section: .080

Overall Nominal Width: 1.726

Overall Flat Section Length: 2 +.5/-0

Overall Twisted Length: 18 in.

Flat Section Center to Center Spacing: 20 +/- .50

Overall Nominal Diameter: 0.042 x 1.726 in.

### Pair

#### Pair Color Code Chart:

| Number | Color      |
|--------|------------|
| 1      | Brown/Tan  |
| 2      | Red/Tan    |
| 3      | Orange/Tan |
| 4      | Yellow/Tan |
| 5      | Green/Tan  |
| 6      | Blue/Tan   |
| 7      | Purple/Tan |
| 8      | Gray/Tan   |
| 9      | White/Tan  |
| 10     | Black/Tan  |

|              |                    |
|--------------|--------------------|
| Over 10 pair | Repeat as required |
|--------------|--------------------|

## Spacing

Twisted Pair Spacing Center to Center: .100

## Mechanical Characteristics (Overall)

Operating Temperature Range: -20°C To +105°C

Bulk Cable Weight: 44 lbs/1000 ft.

## Applicable Specifications and Agency Compliance (Overall)

### Applicable Standards & Environmental Programs

UL Rating: 105°C, 300 V RMS, VW-1

EU CE Mark: Yes

EU Directive 2000/53/EC (ELV): Yes

EU Directive 2002/95/EC (RoHS): Yes

EU RoHS Compliance Date (mm/dd/yyyy): 10/01/2005

EU Directive 2002/96/EC (WEEE): Yes

EU Directive 2003/11/EC (BFR): Yes

CA Prop 65 (CJ for Wire & Cable): Yes

MII Order #39 (China RoHS): Yes

### Flame Test

UL Flame Test: VW-1

## Electrical Characteristics (Overall)

### Nom. Inductance:

| Description | Inductance (µH/ft) |
|-------------|--------------------|
| @ 1 MHz     | .24                |

### Nom. Capacitance Conductor to Conductor:

| Description | Capacitance (pF/ft) |
|-------------|---------------------|
| @ 1 kHz     | 20                  |
| @ 1 MHz     | 16                  |

### Nominal Velocity of Propagation:

| Description | VP (%) |
|-------------|--------|
|             | 64     |

### Nominal Delay:

| Delay (ns/ft) |
|---------------|
| 1.6 NS/FT.    |

### Nom. Conductor DC Resistance:

| DCR @ 20°C (Ohm/1000 ft) |
|--------------------------|
| 68.2 OHMS/1000 FT. MAX.  |

### Nom. Attenuation:

| Freq. (MHz) | Attenuation (dB/100 ft.) |
|-------------|--------------------------|
| 10          | 3.5                      |
| 20          | 5.5                      |
| 30          | 7.2                      |
| 40          | 8.8                      |
| 50          | 10.2                     |
| 60          | 12                       |
| 70          | 13                       |
| 80          | 14.2                     |
| 90          | 15                       |
| 100         | 16                       |

**Max. Operating Voltage - UL:**

| Voltage   |
|-----------|
| 300 V RMS |

**Max. Recommended Current:**

| Current                    |
|----------------------------|
| 1 Amp per conductor @ 20°C |

**Nominal Balanced Characteristic Impedance:**

| Description | Impedance (Ohm) |
|-------------|-----------------|
|             | 115             |

**Nominal Unbalanced Characteristic Impedance:**

| Description | Impedance (Ohm) |
|-------------|-----------------|
|             | 100             |

**Dielectric Withstand Voltage:** 2,000 V RMS

**Typical Balanced Crosstalk - dB Suppression:**

| Description          | Freq. (MHz) | Start Freq. (MHz) | Stop Freq. (MHz) | Crosstalk (dB) |
|----------------------|-------------|-------------------|------------------|----------------|
| 10 ft. sample length |             | 10                | 100              | 35             |

**Typical Unbalanced Crosstalk:**

| Description  | Pulse Rise Time (NS) (MHz) | Near End % (MHz) | Far End % (MHz) |
|--|----------------------------|------------------|-----------------|
| 10 ft. sample length all grounds connected together. | 3                          | 5.8              | 5.2             |
| 10 ft. sample length all grounds connected together. | 5                          | 4                | 3.2             |
| 10 ft. sample length all grounds connected together. | 7                          | 2.5              | 2.8             |

**Notes (Overall)**

**Notes:** The transition area is included in the twisted length to assure a full 2 inches of flat termination area.

**Notes (Cont'd.):** Clear PVC film on both sides of insulated conductors.

**Kennedy Information (Overall)**

**Construction:** 18

**Put Ups and Colors:**

| Item #          | Putup  | Ship Weight | Color | Notes | Item Desc                |
|-----------------|--------|-------------|-------|-------|--------------------------|
| 9V28034 000H100 | 100 FT | 5.900 LB    | NONE  | E     | 17 PR #28 PVC VARI-TWIST |

**Notes:**

E = MAY CONTAIN MORE THAN 1 PIECE. MINIMUM LENGTH OF ANY ONE PIECE IS 25'

# Vari-Twist® 9V280XX Series

.050" Pitch, 28 AWG, PVC

## Product Description

Belden's PVC Vari-Twist 9V280XX series was designed to reduce crosstalk in the balanced mode by twisting the pairs, but can be mass-terminated in the programmed flat sections with any standard IDC connector. To further reduce crosstalk, each adjacent pair is twisted in the opposite direction. The standard twist length is 18 inches followed by a 2 inch flat section of .050" spaced conductors. The cable consists of stranded 28 AWG (7x36) tinned copper, color-coded PVC pre-insulated singles — laminated to a single clear PVC substrate. Eleven various conductor/pair counts are standard; other sizes are available upon request. The cable is UL approved (CSA available upon request) and passes the VW-1 Vertical Wire Flame Test.

Upon your request, Vari-Twist can also be manufactured to your own specific requirements whether that be longer or shorter twist sections and/or flat sections.

**Color Code:** Each pair consists of a Tan conductor paired with a color-coded conductor. *Color Sequence Each Terminating Section:* Brown/Tan, Red/Tan, Orange/Tan, Yellow/Tan, Green/Tan, Blue/Tan, Purple/Tan, Gray/Tan, White/Tan, Black/Tan. Sequence is repeated as necessary.

**Application:** Internal interconnection or internal wiring of electronic equipment.

## Physical Specifications

|                            |   |
|----------------------------|---|
| <b>Conductor</b>           | 28 AWG (7x36) Tinned Copper                   |
| <b>Insulation</b>          | .010" Nom. Wall Color-coded PVC               |
| <b>Substrate</b>           | .010" Nom. Wall Clear PVC                     |
| <b>Pitch</b>               |   |
| Twisted Pair Centers:      | .100" Nom.                                    |
| Conductor Centers in Flat: | .050" ± .005"                                 |
| <b>Pairs</b>               | 1/2" Nom. Lay                                 |
|                            | Adjacent Pairs have Opposite Direction Lay    |
| <b>Construction</b>        | 18" of Twisted Pairs<br>2" of Flat Section    |
| <b>Temperature Rating</b>  | -20 to +105°C                                 |
| <b>Flammability Rating</b> | UL: VW-1                                      |
| <b>UL Approval</b>         | File #E12683,<br>Style Dual Rated 2693 & 2697 |
| <b>CSA Approval</b>        | Available Upon Request                        |
| <b>Packaging</b>           | H100  |

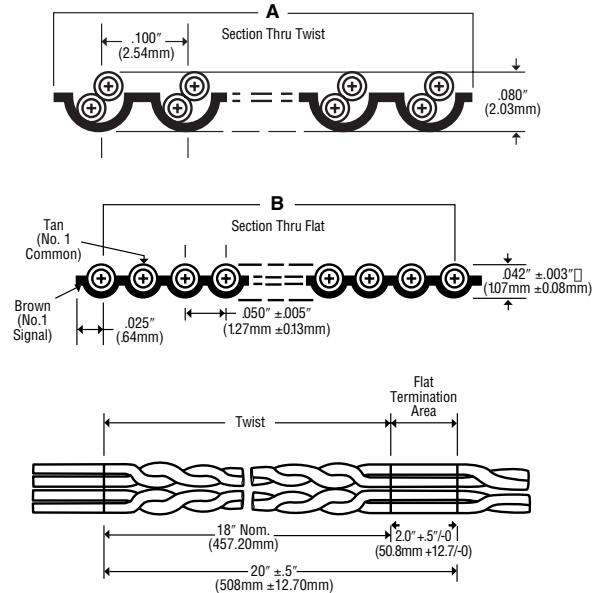
## Electrical Specifications

|                                |                                       |
|--------------------------------|---------------------------------------|
| <b>Voltage Rating</b>          | 300V RMS                              |
| <b>Current Rating</b>          | 1A                                    |
| <b>Conductor Resistance</b>    | 68.2Ω/1000 ft.                        |
| <b>Insulation Resistance</b>   | >1 x 10 <sup>10</sup> Ω • 10 ft. (3m) |
| <b>Impedance (Balanced)</b>    | 115Ω                                  |
| <b>Impedance* (Unbalanced)</b> | 100Ω                                  |
| <b>Capacitance* (@ 1 MHz)</b>  | 16 pF/ft. (52 pF/m)                   |
| <b>Inductance* (@ 1 MHz)</b>   | .24 μH/ft. (.79 μH/m)                 |
| <b>Propagation Delay*</b>      | 1.60 ns/ft. (5.25 ns/m)               |

\*Test Configuration: G-S (ground-signal), unbalanced.

| Part No. | No. of Pairs | Dimensions |       |            |            |
|----------|--------------|------------|-------|------------|------------|
|          |              | Width "A"  |       | Span "B"   |            |
|          |              | Inch       | mm    | Inch       | mm         |
| 9V28010  | 5            | .50        | 12.70 | .45 ±.012  | 11.43 ±.31 |
| 9V28014  | 7            | .70        | 17.78 | .65 ±.012  | 16.51 ±.30 |
| 9V28016  | 8            | .80        | 20.32 | .75 ±.012  | 19.05 ±.30 |
| 9V28020  | 10           | 1.00       | 25.40 | .95 ±.015  | 24.13 ±.38 |
| 9V28026  | 13           | 1.30       | 33.02 | 1.25 ±.015 | 31.75 ±.38 |
| 9V28034  | 17           | 1.70       | 43.18 | 1.65 ±.015 | 41.91 ±.38 |
| 9V28036  | 18           | 1.80       | 45.72 | 1.75 ±.017 | 44.45 ±.43 |
| 9V28040  | 20           | 2.00       | 50.80 | 1.95 ±.017 | 49.53 ±.43 |
| 9V28050  | 25           | 2.50       | 63.50 | 2.45 ±.017 | 62.23 ±.43 |
| 9V28060  | 30           | 3.00       | 76.20 | 2.95 ±.020 | 74.93 ±.51 |
| 9V28064  | 32           | 3.20       | 81.28 | 3.15 ±.020 | 80.01 ±.51 |

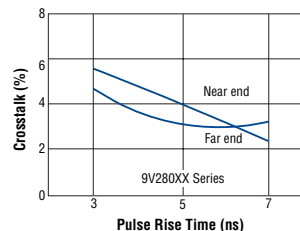
## Dimensions



NOTE: the transition area is included in the twisted section to assure a full 2 Inches of flat termination area.

## Unbalanced Crosstalk\*

(See page 7.14 for Balanced Crosstalk)



## Attenuation\*

